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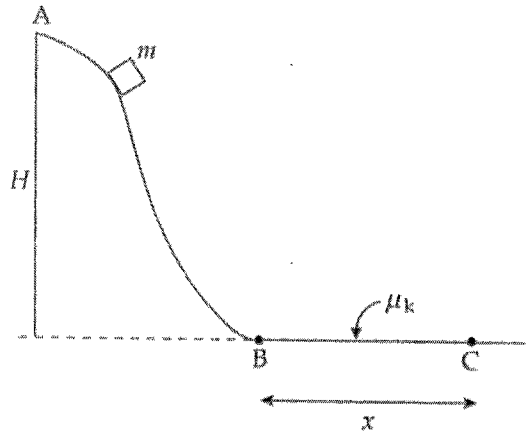
AP Conservation of Energy



I love Physics, I do love Physics, Physics is a good thing,

1) A box of mass ***m*** *is released from rest at Point A, the top of a long frictionless slide. Point A is at height* ***H*** *above the level of points B and C. Although the slide is frictionless, the horizontal surface from Point B to C is not. The coefficient of kinetic friction between the box and this surface is* μ*, and the horizontal distance between points B and C is* ***x****.*

a) Find the speed of the box when its height above Point B is 1/2 H

$\sqrt{gh}$

b) Find the speed of the box when it reaches Point B.

$\sqrt{2gh}$

c) Determine the value of μ *so that the box comes to rest at point C.* $\frac{h}{x}$

d) Now assume that points B and C were not on the same horizontal level. In particular, assume that the surface from B to C had a uniform upward slope so that Point C were still at a horizontal distance of ***x*** *and B but now at a vertical height of* ***y*** *above B. Answer the question posed in (c).*

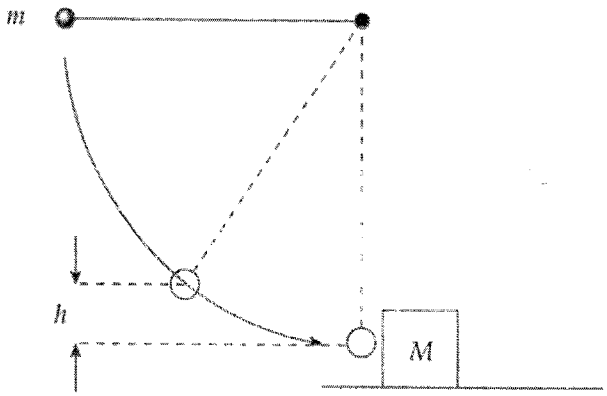
e) If the slide were not frictionless, determine the work done by friction as the box moved from Point A to Point B if the speed of the box as it reached Point B were half the speed calculated in part (b).

2) A steel ball of mass ***m*** *is fastened to a light cord of length* ***L*** *and released when the cord is horizontal. At the bottom of its path, the ball strikes a hard-plastic block of mass* $M = 4m$*, initially at rest on a frictionless surface. The collision is elastic.*

a) Find the tension in the cord when the ball's height above its lowest position is 1/2 ***L****. Write your answer in terms of m and g only.*

b) Find the speed of the block immediately after the collision.

c) To what height ***h*** *will the ball rebound after the collision?*



$F_{centripetal} = m v^2 / r$

3) A 40 kg mass was set on a spring whose spring constant was 800 Newton per meter. a) How far was the spring compressed? b) How much work was done on the spring? c) How far would this mass reach above the spring platform if it was to leave and enter into the air?